

CLAIMS

1. A radio channel assignment method of employing a multicarrier TDMA (Time Division Multiple Access) system in which communication is performed using a specific carrier in each transmission/reception slot that is obtained
5 through time division, and of assigning a transmission/reception slot and a carrier, as a radio channel, that satisfy desired quality to each mobile station, comprising:
- a table managing step of
 - managing a frequency management table that includes groups
10 each having a specific number of carriers that form a radio channel so as to be distributed over wide frequency bands;
 - cyclically measuring a received level of interference at the radio channel using an idle slot; and
 - holding results of measurement in order from a carrier at which
15 the received level is lowest, by each of the groups in slots;
 - a radio-channel-candidate deciding step of
 - deciding a slot to be assigned and candidates for a carrier to be assigned in the slot to be assigned based on the frequency management table, when assignment of a radio channel is requested (re-request is also
20 included);
 - a lowest-received-level-carrier selecting step of
 - performing a carrier sense on the candidates for a carrier to be assigned in the slot to be assigned; and
 - selecting a carrier at which the received level is the lowest, out
25 of the candidates; and

a radio channel deciding step of
comparing the received level at the carrier selected with a
specific threshold value that is used to determine whether interference or
interruption occurs; and

5 deciding the carrier selected as a carrier to be assigned when
the received level is less than the specific threshold value.

2. The radio channel assignment method according to claim 1, wherein
the table managing step further includes

10 setting individual priorities in the groups in each of base
stations that form a system, and

the radio-channel-candidate deciding step further includes

searching (determining) each group of the slots based on the
priorities; and

15 deciding a slot to be assigned and candidates for a carrier to
be assigned in the slot to be assigned, based on results of search.

3. The radio channel assignment method according to claim 2, wherein
as a result of comparison at the radio channel deciding step, if the received
20 level at the carrier selected is not less than the specific threshold value, each
group of the slots is searched (determined) again based on the priorities, and
the process at the radio-channel-candidate deciding step is performed.

4. The radio channel assignment method according to claim 2, wherein
25 the radio-channel-candidate deciding step further includes

a setting step of

setting a carrier sense level that can be set stepwisely, to a predetermined level; and

5 setting a group that is initially searched in the frequency management table as a group with the priority that is highest; and

an assigned-slot deciding step of

determining, in each slot, whether the received level at a head carrier of carriers assigned to the set group is below the set carrier sense level; and

10 if at least one of received levels of interference at head carriers is below the set carrier sense level;

deciding a slot having a head carrier at which the received level is the lowest, as a slot to be assigned.

15 5. The radio channel assignment method according to claim 4, wherein as a result of determination at the assigned-slot deciding step, if there is no head carrier at which the received level is below the set carrier sense level, then it is further determined whether the priority of the set group is the lowest, and

20 if the priority is not the lowest, then the priority of the set group is decreased, and the processes at the assigned-slot deciding step are performed again.

25 6. The radio channel assignment method according to claim 5, wherein as a result of determination whether the priority of the set group is the lowest, if

the priority is the lowest, then it is further determined whether the set carrier sense level is the maximum,

if the set carrier sense level is not the maximum, the set carrier sense level is increased, the priority of the set group is set to the highest, and the processes at the assigned-slot deciding step are performed again, and

if the set carrier sense level is the maximum, then assignment of a slot and a carrier is refused.

7. The radio channel assignment method according to claim 4, wherein if there is a plurality of slots each having a head carrier at which the received level is the lowest,

the assigned-slot deciding step further includes

deciding a slot, of the slots, in which a received-level measurement time is closest to a current time, as a slot to be assigned.

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8. The radio channel assignment method according to claim 7, wherein as a result of determination at the assigned-slot deciding step, if there is no head carrier at which the received level is below the set carrier sense level, then it is further determined whether the priority of the set group is the lowest, and

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if the priority of the set group is not the lowest, the priority of the set group is decreased, and the processes at the assigned-slot deciding step are performed again.

9. The radio channel assignment method according to claim 8, wherein

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as a result of determination whether the priority of the set group is the lowest, if the priority is the lowest, then it is further determined whether the set carrier sense level is the maximum level,

if the set carrier sense level is not the maximum level, the set carrier
5 sense level is increased, the priority of the set group is set to the highest, and the processes at the assigned-slot deciding step are performed again, and

if the set carrier sense level is the maximum level, then assignment of a slot and a carrier is refused.

10 10. The radio channel assignment method according to claim 2, wherein the radio-channel-candidate deciding step further includes

a setting step of

setting a carrier sense level that can be set stepwisely, to a predetermined level, and

15 setting a group that is initially searched in the frequency management table as a group with the priority that is highest, and

an assigned-slot deciding step of

determining, in each slot, whether received levels of interference at head carriers of the carriers assigned to the set group are below
20 the set carrier sense level,

if it is determined that at least one of the received levels at the head carriers is below the set carrier sense level,

obtaining the number of carriers at which the received level is below the set carrier sense level, in each slot having a head carrier at which
25 the received level is below the set carrier sense level,

and

deciding a slot having the number of carriers that is largest, as a slot to be assigned.

5 11. The radio channel assignment method according to claim 10, wherein
as a result of determination at the assigned-slot deciding step, if there is no
head carrier at which the received level is below the set carrier sense level,
then it is further determined whether the priority of the set group is lowest, and
if the priority of the set group is not the lowest, the priority of the set
10 group is decreased, and the processes at the assigned-slot deciding step are
performed again.

12. The radio channel assignment method according to claim 11, wherein
as a result of determination whether the priority of the set group is the lowest, if
15 the priority is the lowest, then it is further determined whether the set carrier
sense level is the maximum,
if the set carrier sense level is not the maximum level, the set carrier
sense level is increased, the priority of the set group is set to the highest, and
the processes at the assigned-slot deciding step are performed again, and
20 if the set carrier sense level is the maximum, then assignment of a slot
and a carrier is refused.

13. The radio channel assignment method according to claim 10, wherein
as a result of obtaining the number of carriers at which the received level is
25 below the set carrier sense level, if each of the slots has the same number of

carriers and if the set carrier sense level is not the maximum,

the assigned-slot deciding step further includes

obtaining the number of carriers at which the received level is
below a carrier sense level newly set until the carrier sense level is increased
5 stepwisely to the maximum or until there are no slots each having the same
number of carriers, and finally,

deciding a slot having the number of carriers that is the largest,
as a slot to be assigned.

10 14. The radio channel assignment method according to claim 13, wherein
as a result of determination at the assigned-slot deciding step, if there is no
head carrier at which the received level is below the set carrier sense level,
then it is further determined whether the priority of the set group is the lowest,
and

15 if the priority is not the lowest, the priority of the set group is decreased,
and the processes at the assigned-slot deciding step are performed again.

15. The radio channel assignment method according to claim 14, wherein
as a result of determination whether the priority of the set group is the lowest, if
20 the priority is the lowest, then it is further determined whether the set carrier
sense level is the maximum level,

if the set carrier sense level is not the maximum level, the set carrier
sense level is increased, the priority of the set group is set to the highest, and
the processes at the assigned-slot deciding step are performed again, and

25 if the set carrier sense level is the maximum level, then assignment of

a slot and a carrier is refused.

16. The radio channel assignment method according to claim 10, wherein
as a result of obtaining the number of carriers at which the received level is
5 below the set carrier sense level, if each of the slots has the same number of
carriers, and if the priority of the set group is not the lowest,

the assigned-slot deciding step further includes

obtaining the number of carriers at which the received level is
below the carrier sense level until the priority of the set group is decreased
10 stepwisely to the lowest or until there are no slots each having the same
number of carriers, and finally,

deciding a slot having the number of carriers that is the largest,
as a slot to be assigned.

15 17. The radio channel assignment method according to claim 16, wherein
as a result of determination at the assigned-slot deciding step, if there is no
head carrier at which the received level is below the set carrier sense level,
then it is further determined whether the priority of the set group is the lowest,
and

20 if the priority of the set group is not the lowest, the priority of the set
group is decreased, and the processes at the assigned-slot deciding step are
performed again.

18. The radio channel assignment method according to claim 17, wherein
25 as a result of determination whether the priority of the set group is the lowest, if

the priority is the lowest, then it is further determined whether the set carrier sense level is the maximum level,

if the set carrier sense level is not the maximum level, the set carrier sense level is increased, the priority of the set group is set to the highest, and
5 the processes at the assigned-slot deciding step are performed again, and

if the set carrier sense level is the maximum level, then assignment of a slot and a carrier is refused.

19. The radio channel assignment method according to claim 2, wherein
10 the radio-channel-candidate deciding step further includes

selecting a predetermined number of carriers from a head of a group of which priority is highest in the slot to be assigned,

determining whether received levels of interference at the carriers are less than a threshold level that is used to determine whether the carriers can
15 be candidates for the carrier to be assigned, and

if the received levels at all the carriers as determination targets are less than the threshold level,

deciding the carriers as candidates for the carrier to be assigned.

20 20. The radio channel assignment method according to claim 19, wherein as a result of determination whether the received level is less than the threshold level, if there is a carrier determined as the carrier at which the received level is not less than the threshold level,

it is determined whether the received levels at carriers that form each
25 of the groups are less than the threshold level, until the number of candidates

for the carrier to be assigned reaches the predetermined number while decreasing the priority of the group.